REMARKS/ARGUMENTS

Reconsideration and allowance are respectfully requested.

Objection to the Title

The examiner objects to the title of the present application ("Bistable nematic liquid crystal device") as not sufficiently descriptive. Although Applicant disagrees with this objection, a new title " A Liquid Crystal Device Exhibiting Zenithal Bistability And A Cell Wall For Such A Device" is provided with this amendment. Withdrawal of the objection to the title is requested.

Obviousness Double Patenting Rejections

A number of obviousness-type double patenting rejections have be made based on the parent patents from which this application claims priority under 35 U.S.C. §120. Although Applicants disagree with these rejections, a terminal disclaimer has been filed to obviate all of these rejections.

Anticipation Rejections

Claims 17-19 and 36 stand rejected for anticipation based on Nobili et al. Claim 32 stands rejected for anticipation based on USP 5,280,375 to Tsuda et al. Claims 32, 34, and 35 stand rejection for anticipation based on USP 5,831,700 to Li et al. Claims 32-36 stand rejected for anticipation based on USP 4,333.708 to Boyd et al. These rejections are respectfully traversed.

To establish that a claim is anticipated, the Examiner must point out where each and every limitation in the claim is found in a single prior art reference. *Scripps Clinic & Research Found. v. Genentec, Inc.*, 927 F.2d 1565 (Fed. Cir. 1991). Every limitation contained in the claims must be present in the reference, and if even one limitation is missing from the reference,

then it does not anticipate the claim. *Kloster Speedsteel AB v. Crucible, Inc.*, 793 F.2d 1565 (Fed. Cir. 1986). None of Nobili, Tsuda, Li, or Boyd satisfies this rigorous standard.

Nobili

Nobili teaches how an SiO layer can be evaporated onto a surface to provide a liquid crystal alignment layer having "two easy directions $\mathbf{n_0}$ and $\mathbf{n_0'}$." See lines 4-6 of the introduction on page 531 of Nobili. Figure 1 of Nobili shows the two states ($\mathbf{n_0}$ and $\mathbf{n_0'}$) that can be selected for such a device. In particular, the description of figure 1 states that "$\mathbf{n_0}$ and $\mathbf{n_0'}$ are characterized by a zenithal angle θ_0 and azimuthal angles φ_0 and $-\varphi_0$." This is also explained at lines 5-8 of the text on page 533 with the sentence that begins "In the bistable region of evaporation...." Nobili thus discloses an azimuthally bistable liquid crystal device in which the two stable states differ in twist angle but both have the same tilt angle θ_0.

The term "pretilt" is understood by those of ordinary skill in the art to refer to the tilt angle(s) imparted to liquid crystal molecules near a surface. Claim 17 recites that the first surface of the first cell wall is "treated to provide a bistable pretilt to molecules of liquid crystal material." Claim 36 recites that the first surface of the first cell wall is "treated to provide two different pretilt angles to molecules of liquid crystal material." So claims 17 and 36 define zenithally bistable liquid crystal devices in which there are two stable states each with a different pretilt.

Nobili does not disclose a device having a cell wall that provides "bistable pretilt," or a device having a cell wall that provides "two different pretilt angles." The pretilt angle associated with both the stable states in Nobili is a single angle θ_0. Lacking features recited in claims 17 and 36, the anticipation rejection based on Nobili should be withdrawn.

Tsuda

Tsuda discloses a liquid crystal device having an alignment surface that carries two different monostable alignment layers, with each layer being associated with only one stable liquid crystal configuration. See lines 9-22 of column 6. Figure 1 of Tsuda shows a first (monostable) alignment layer 5 and second (monostable) alignment layer 7. Alignment layers 5 and 7 impart different pretilt angles to the liquid crystal material to improve the viewing characteristics when a voltage is applied. Each layer only has one stable state to which it returns when an applied voltage is removed.

In contrast to Tsuda's two different monostable alignment treatments on adjacent regions of a substrate, claim 17 "a cell wall having a first surface treated to provide a bistable pretilit to molecules of liquid crystal material...wherein said bistable nematic liquid crystal device provides two stable and optically distinguishable liquid crystal configurations," and claim 32 recites "said first stable liquid crystal configuration being optically distinguishable from said second stable liquid crystal configuration....[a] cell wall having a first surface to provide two different pretilt angles in the same azimuthal plane...." Each portion of the cell wall disclosed by Tsuda imparts a single, predetermined, pretilt to the liquid crystal material. In other words, all the alignment treatments used in Tsuda are monostable rather than bistable. Lacking features recited in claim 32, the anticipation rejection based on Tsuda should be withdrawn.

Li

Li discloses a four domain, twisted nematic liquid crystal device. In figure 1, different monostable alignment conditions (e.g. the use of different rubbing directions) are applied to the surfaces of the four areas d1 to d4. See column 7, line 16 to column 8, line 35. The different surface alignment properties, combined with the polymer matrix stabilization, allow four

different, twisted nematic domains. But each of the four domains is monostable relaxing back to its single stable state when the applied voltage is removed.

Like Tsuda, Li discloses locating a number of different alignment treatments on adjacent regions of a substrate. All the surface treatments listed from line 54 of column 10 through line 5 of column 11 are monostable. Lacking a teaching of using a bistable surface, Li fails to disclose "said first stable liquid crystal configuration being optically distinguishable from said second stable liquid crystal configuration....[a] cell wall having a first surface to provide two different pretilt angles in the same azimuthal plane...." The anticipation rejection based on Li should be withdrawn.

Boyd

The Examiner has already correctly noted a fundamental difference between devices of the type described in Boyd and devices of the type described in this application in the reasons for allowance for parent application 09/740,260. (See page 5 of the Office Action dated 29-Aug-2001). In particular, the Examiner previously noted that Boyd shows a structure having a patterned surface and different pretilt angles. The Examiner stated, when describing the Boyd reference, that "*it is not that grating that permits/requires/provides, in short, is responsible for the different pretilt angles and bistable configurations. Boyd attains bistability by requiring motion of a discontinuity across the body of the cell to switch states.*"

The Examiner's previous comments are relevant here. Boyd does not disclose a cell wall "having a first surface to provide any one of two different pretilt angles in the same azimuthal plane to molecules of liquid crystal material." As noted by the Examiner, the surfaces of the Boyd device do not provide the claimed different pretilt angles or the bistability described in claim 32. The Boyd device uses a bulk effect to achieve bistability that alters the tilt angle of

liquid crystal material at the surface. Claim 32 and Boyd use different alignment structures and employ different physical effects to achieve bistable device operation.

The anticipation rejection based on Boyd should be withdrawn.

Obviousness Rejections

Claims 26-29 and 31 stand rejected as being obvious over Tsuda (US5,280,375) in view of Tsuboyama (US4,775,225). Claim 30 (dependent on claim 26) stands rejected for obviouseness over Tsuda and Tsuboyama in view of Wenz (US5,268,782). These rejections are respectfully traversed.

As described above, Tsuda teaches separate adjacent regions of different monostable alignment. Tsuda does not teach one surface patterned "to provide two different pretilt angles in the same azimuthal plane." Furthermore, Tsuda does not disclose a surface having a patterned surface profile that "comprises at least one pillar."

Tsuboyama describes a bistable ferroelectric display device that includes a plate having protrusions that act as spacer elements. Surface stabilized ferroelectric LCDs are known devices (e.g. see lines 36-46 of column 1 of Tsuboyama) in which the ferroelectric liquid crystal material is itself bistable. Ferroelectric LCDs thus include monostable alignment surfaces (e.g. a rubbed polymer as described at lines 8-19 of column 6 of Tsuboyama). A person of ordinary skill in this art would not have been motivated to combine teachings in the field of ferroelectric LCDs (as contained in the Tsuboyama reference) with teachings related to nematic liquid crystal devices as taught by Tsuda. Nematic and ferroelectric LCD are distinct types of devices that operate in quite different ways.

But even if one attempted to combine Tsuda and Tsuboyama for purposes of argument, there is no motivation in either reference or in the prior art generally to replace the monostable

alignment regions taught by Tsuda with a zenithally bistable surface that is patterned "to provide two different pretilt angles in the same azimuthal plane." In addition, Tsuda's polymer rubbing is not a "patterned surface profile," as also recited in claim 26. The combinations of references employed in the remaining obviousness rejections do not remedy the deficiencies noted already with the primary reference and their respective independent claim. Accordingly, the obviousness rejections should be withdrawn.

This application is in condition for allowance. An early notice to that effect is earnestly solicited.

Respectfully submitted,

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